



September 20, 1972

DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION SPECIFICATION

MODIFICATION KITS FOR ARSR LIQUID COOLING SYSTEMS

1. SCOPE AND CLASSIFICATION

1.1 Scope.- This specification covers the requirements for modification kits for the liquid-cooling systems of the Air Route Surveillance Radar (ARSR) systems, (1) to replace the tubing, fittings, and coolant in the system, (2) to replace the existing pump and motor drive couplers, and (3) to relocate the cooling system drive motor and pump assemblies with coolant reservoirs as a noise source from the electronic equipment room.

1.2 Classification.- Two types of liquid-cooling systems are covered by this specification; Type I, for ARSR-1 radar system and Type II, for ARSR-2 radar system. Different building/equipment configurations exist from site to site.

1.2.1 Types.- The liquid-cooling systems are mechanically similar and each system is comprised of an electric motor that drives a pump at 1740 RPM to deliver the coolant to the radar components at a rate of at least 10 GPM under a pump output pressure of 300 PSIG or greater.

2. APPLICABLE DOCUMENTS

2.1 FAA documents.- The following FAA specifications, standards, and drawings, of the issues specified in the invitation for bids or request for proposals, form a part of this specification and are applicable to the extent specified herein.

2.1.1 FAA specifications.-

FAA-C-1217 Electrical Work, Interior

FAA-G-1210 Provisioning Technical Documentation

FAA-G-2100/1 Electronic Equipment, General Requirements,
Part 1, Basic Requirements for All Equipments

FAA-G-1375 Spare Parts-Peculiar for Electronic, Electrical,
and Mechanical Equipment

2.1.2 FAA standards.-

FAA-STD-012 Paint Systems for Equipment

FAA-STD-013a Quality Control Program Requirements

2.1.3 FAA orders.-

Order 6032.1, Modifications to Ground Facilities, Systems,
and Equipment in the National Airspace System

Order 1320.33, EEM, PEM, EFI, and PFI Handbook, dated 6/21/67

2.1.4 FAA drawings.-

D-31299 ARSR-1A Transmitter Room-Equipment Layout,
Waveguide and Ferrite Circulator

D-31300 ARSR Amplitron Air Compressor and Coolant Lines

D-5109-5A ARSR Amplitron Heat Exchanger Platform

D-5109-4 ARSR-1 Transmitter and Receiver Building Floor
Plan and Elevation

2.2 Military and federal publications.- The following military and federal publications, of the issues in effect on the date of the invitation for bids or request for proposals, form a part of this specification and are applicable to the extent specified herein.

2.2.1 Military standard.-

MIL-STD-454C Standard General Requirements for Electronic Equipment

2.2.2 Military specification.-

MIL-E-17555G Electronic and Electrical Equipment, Accessories
and Repair Parts, Packaging and Packing of

2.3 Other publications.- The following publications of the issue in effect on the date of the invitation for bids or request for proposals, form a part of this specification and are applicable to the extent specified herein.

ARSR Manufacturer's Instruction Books

SMP 6340.2 Maintenance of Air Route Surveillance Radar (ARSR)
Facilities

NFPA No. 70 National Electrical Code

(Copies of the applicable FAA specifications, standards, orders, and drawings may be obtained from the Contracting Officer in the Federal Aviation Administration Office issuing the invitation for bids or request for proposals. Requests should fully identify material desired, i.e., specification numbers, standards numbers, dates, amendment and drawing numbers and dates. Requests should cite the invitation for bids, request for proposals, or the contract involved or other use to be made of the requested material.)

(Single copies of Military standards may be obtained from U. S. Naval Supply Depot, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.)

(Information on obtaining copies of the National Electrical Code may be obtained from the National Fire Protection Association, 60 Batterymarch Street, Boston, Massachusetts 02110.)

(ARSR equipment handbooks and instruction books which form a part of this specification will not be issued for preparation of proposals; reference copies are available in the Department of Transportation Library, FOB 10A, Washington, D. C.)

3. REQUIREMENTS

3.1 General functional requirements.- The equipment and materials specified herein shall be furnished as a kit to the FAA, capable of being installed by facility work force, to replace the pump, drive motor coupler, tubing, fittings, joints, and coolant in the existing liquid-cooling system, and to relocate the drive motor, pump, and mounting base assembly including their companion coolant reservoirs from the amplatron power supply cabinets in the electronic equipment room to the engine generator room. These changes are required to eliminate failures in the cooling system due to corrosion or erosion, or both, and to remove the drive motor and pump assembly as a noise source from the electronic equipment room environment. The operation of the existing liquid-cooling system is monitored by various pressure, temperature, and flow rate sensing devices mounted in the cooling circuit. When the cooling system parameters are not within the prescribed limits of operation, these sensing devices will automatically redirect the flow of the cooling fluid to compensate for over-pressure or over-temperature condition or will automatically disable

the amplatron transmitter of the ARSR system when the coolant fluid flow rate is low or when the over-pressure or over-temperature conditions are not relieved. When the modifications are complete, the operation and monitoring of the liquid cooling system shall be in accordance with the ARSR manufacturer's instruction book.

3.2 Government-furnished equipment and services.- The Government will provide for access to existing radar sites for a survey of system configurations. Visits to operational sites will be limited and strictly controlled by the Contracting Officer or his Technical Officer. The Government is not obligated to provide radar downtime or to allow the contractor to control or adjust any portion of the radar system, except during installation and testing of the kits.

3.2.1 System availability.- The Government shall provide downtime of the standby channel of the dual channel ARSR system for contractor survey. The downtime of the standby channel will be strictly controlled by the Contracting Officer or his Technical Officer who will effect the coordination necessary for standby channel availability. The work shall be performed on the standby channel with a minimum of channel unavailability time for operations and with a minimum of disruption to the technical maintenance activities at the facility. When the contractor's survey of the liquid-cooling system in the standby channel is completed, this channel will be returned to operational service by the Contracting Officer or his Technical Officer.

3.2.2 Work period.- The Government will determine the scheduling of work periods to allow the contractor to perform the required work to insure a minimum disruption to the 24 hour day operations. The schedules that the contractor shall be allowed to work at each facility shall be with the coordination of operations technical personnel at that facility.

3.2.3 Drive motor, pump, and mounting base assembly.- The Government shall furnish one drive motor, pump, and mounting base assembly to the contractor for examination to ensure mechanical compatibility with the existing system.

3.3 Equipment, services and materials to be furnished by the contractor.- The contractor shall furnish all materials, equipment, labor, and services required to:

(1) design, develop, furnish, install, field test and document one Type I and one Type II modification kit; and,

(2) furnish additional modification kits in quantities and types as required in the contract documents for the FAA facility work force to replace the pump, motor drive coupler, tubing, fittings, and coolant and to relocate the drive motor and pump assemblies including the coolant reservoirs from the amplatron power supply cabinets in the electronic equipment room to the engine generator room. Each ARSR facility has dual

radar channels; therefore, each kit shall include and accommodate the requirements of two individual liquid cooling systems. The two drive motor and pump assemblies and the two coolant reservoirs shall be installed in a common rack in the engine generator room.

3.3.1 First Article Modification Kits, Type I and Type II.- The contractor shall thoroughly familiarize himself with all details of the work and working conditions to verify all dimensions in the field, and to advise the Contracting Officer of any discrepancy before performing any work. The contractor shall furnish and transport to the designated ARSR facilities all equipment, materials and supplies in kit form. The kits shall be in accordance with paragraph 3.3.2 and all subparagraphs thereunder except the instruction books for each type may be furnished after completion of field testing of the first kit of that type and prior to or concurrent with the first deliveries of the additional modification kits being provided under the contract. The contractor shall modify two liquid cooling systems per kit test site ARSR facility. The replaced pump, drive motor coupler, tubing, and fittings and the existing valves, switches, gauges, and other devices within the liquid cooling system shall be reinstalled to maintain the existing tubing circuit configuration except for such configuration changes required to accommodate relocating the motor and pump assemblies and the coolant reservoirs. The contractor shall overhaul or replace with GFP any worn or defective components of the coolant system that are to be reinstalled or reused.

3.3.1.1 Modifying the existing system.- The contractor shall have completed all new electrical and mechanical work external to the existing system prior to starting any modification of the existing system. All tubing, fittings, unions, supports, and support hardware required to connect the pumps and coolant reservoirs at the new location to the existing plumbing circuits shall be completed prior to replacing any tubing or fittings, or both, in the old cooling systems. All tubing, fittings, and union work shall be free of burrs, breaks, and other discontinuities. The completed tubing circuit shall be purged with compressed air to remove all foreign particles from the tubing circuit. All new electrical conduit and cabling, supports and support hardware required to connect the drive motor at its new location to the existing branch circuit used to start and stop the drive motor shall be completed prior to any modification to the existing electrical system. The contractor shall make provision for local start and stop of the drive motors in the new location.

3.3.1.1.1 Existing tubing and fittings.- The existing cooling system shall be drained of the existing coolant and shall be purged to remove any residue of the existing coolant and to remove any scaling formation in the system. Existing tubing and fittings are to be replaced with items similar in configuration and dimension to like items furnished under 3.3.1.1. All gauges, valves, switches, filters, and sensing devices in the coolant system are to be reinstalled to maintain the existing coolant flow configuration.

3.3.1.1.2 Existing electrical circuits.- The existing drive motor control circuitry shall be utilized to control the drive motor at its new location. The existing 3 phase 120/208 VAC circuit connected to the drive motor terminals shall be rerouted to a terminal block in the Amplitron Power Supply Cabinet for connection to a new circuit routed to the relocated drive motor.

3.3.1.1.3 Grounding.- The liquid-cooling system tubing, conduit, pump, motor, mounting base, coolant reservoir, and equipment rack when installed are required to be at ground potential in accordance with FAA-C-1217.

3.3.1.1.4 Masonry.- The contractor shall restore any masonry damaged through the installation of any mechanical or electrical, or both, piping and tubing or other appurtenances.

3.3.1.1.5 Installation tools and test equipment.- The contractor shall furnish all tools and test equipment required for the installation and test. The contractor may use Government-owned test equipment available on site on an "as available" and "as is" basis.

3.3.1.2 Reliability and maintainability.- The items installed in modifying the liquid-cooling system shall not degrade the availability of the existing radars system. The existing operational availability of the ARSR-1/2 radars is 99.1%. The mean-time-to-repair (MTTR) of the installed items shall not be more than 30 minutes. The contractor shall perform reliability analysis to determine compliance with existing system availability. The analysis shall show that the changes shall not derogate existing system performance.

3.3.1.3 Field tests.- The contractor shall conduct and satisfactorily complete all field tests required by paragraph 4.3 before final factory tests are conducted on any additional modification kits at the contractor's plant as required by paragraphs 4.2 and 4.2.1.

3.3.1.4 Documentation.- The contractor shall furnish plant-in-place drawings, schematic, wiring, and tubing diagrams, clearly and completely depicting the changes at each individual field test site. Three copies plus one reproducible master of such documentation shall be provided.

3.3.1.4.1 Special technical data.- The contractor shall furnish one legible, permanent, reproducible (camera copy) set of both electrical and mechanical specifications and drawings for each nonstandard part, component, or other article used in the modified system which is not available as a stock item from at least one manufacturer other than the contractor (including its affiliated companies and, for subcontracted components or articles, its subcontractors). Specifications and drawings for articles such as racks and similar articles which are not subject to wear and tear or failure in the normal course of use are not required. A set of precision masters shall be furnished for the pump, coupler and mounting base assembly. The

drawings, specifications, and precision masters furnished shall be complete and of sufficient detail that replacement articles can be manufactured therefrom that are identical in all significant characteristics to those articles originally supplied.

3.3.1.4.2 List of special tools.- The contractor shall submit for approval a list of special tools, if any, over and above those already on site which will be required for maintenance. The limits of the use of special tools shall be in accordance with MIL-STD-454C, Requirement 63.

3.3.1.5 Protection and cleanup.- The contractor shall assume all responsibility for any obstruction to normal facility operation, any damage to facility equipment, and any personnel hazards or inconveniences during his work at the facilities and further be responsible for repair and replacement of material or equipment damaged as a result of inadequate protection against obstruction. The contractor shall assume all responsibility for cleanup and disposal of dust, debris, waste materials, equipment, materials, and supplies resulting from and used in his activities at the facility.

3.3.2 Modification Kit, Type I and Type II.-

3.3.2.1 Rack.- The contractor shall furnish a welded steel open framework with maximum dimensions of 27 inches in width and 36 inches in depth complete with mechanical and electrical accessories to mount the two drive motors, pumps, and mounting base assemblies with coolant reservoirs one above the other. The entire assembly must be mounted in the rack so that when the drive motor and pump are installed in the normal operating position, the pump and motor will be positioned according to the manufacturer's recommendations for optimum loading of the bearings and proper functioning of the lubrication system. All components of the system shall be readily accessible for maintenance or replacement. The prefabricated rack is to be installed in the facility engine generator room in the available space. See FAA Drawing D-31299 for a typical site layout. Not all sites conform to this drawing.

3.3.2.2 Pump.- The contractor-furnished pump shall be power driven rotary type with mechanical seal, shall be self-lubricating using water as a lubricant, shall operate at 1740 RPM input shaft speed and shall pump a solution of ethylene glycol and distilled water, or equal, at a flow rate of at least 10 GPM at 300 PSIG or greater pressure within the temperature range of -50°C and 100°C. The pump fittings and input and output ports shall be mechanically compatible with the existing system and shall resist corrosion or erosion, or both, by the coolant fluid. The noise limit level of the pump assembly with both pumps operating at the specified pressure, temperature, and flow rate shall not exceed 65 dBA measured at a distance of 3 feet around the pump rack. The contractor may furnish, at his option, removable acoustical enclosures to achieve the specified sound level. The contractor-furnished pump shall have a life cycle of not less than 10 (ten) years.

3.3.2.3 Motor drive coupler.- The motor drive coupler shall be furnished by the contractor to operate the pump using the existing drive motor. The motor drive coupler shall be flexible with setscrews and keyway.

3.3.2.4 Mounting base adaptor.- The contractor furnished pump will be mechanically compatible with the existing mounting base for the existing drive motor and pump assembly or the contractor shall provide for modification of the existing type mounting base, or a mounting base adaptor, to effect the required pump replacement.

3.3.2.5 Tubing, fittings, and supports.- The contractor shall furnish stainless steel tubing, AISI Type 301, or better, and fittings of similar material to replace the existing cooling system tubing and fittings, to extend the tubing circuit to the new pump and coolant reservoir location, and to operate the liquid-cooling system at the flow rate, pressure, and temperature specified. The tubing shall be of nonmetallic materials where required to provide electrical, vibrational, and acoustical isolation within the system and shall resist any damage or deterioration by the coolant at the pressure, temperature, and flow rate specified. All non-welded tubing joints and unions shall have gasket materials that will not shrink, swell, or deteriorate when exposed to the coolant. All stainless steel parts shall be given a passivation treatment after machining operations have been completed. Horizontal runs of tubing shall be supported in vibration--damping hangers at least every ten (10) feet. Flexible bushings shall be provided at each point where tubing enters or exits from masonry. Bushings shall provide vibration damping, noise isolation, and air seal. All materials, parts, and supplies shall meet the requirements of FAA-G-2100/1, paragraphs 1-3.8.7 and 1-3.15.1.1, and of MIL-STD-454C, Requirement 49.

3.3.2.6 Coolant.- The coolant fluid shall be a mixture of distilled water and ethylene glycol, or equal, and shall remain fluid over the temperature range of from -50°C to 100°C. The coolant shall not cause corrosion or erosion, or both, of the metallic or nonmetallic materials of the cooling system.

3.3.2.7 Shock Mountings.- The drive motor, pump, and mounting base shall be provided with new shock mountings equal to or superior to the existing shock mount assembly.

3.3.2.8 Electrical requirements.-

3.3.2.8.1 Conduit.- Rigid metal conduit of corrosion-resistant materials shall be used and shall not be smaller than three-fourth inch. Flexible metal conduit, with a separate grounding conductor, shall be used for connection to the motor. Rigid metal conduit shall be provided for installation as a complete system to be securely anchored within three feet of each cabinet, rack, terminal block or circuit breaker. The conduit shall be supported at least every 10 feet. The conduit runs shall be parallel to the building line. The radius of the curve of the inner edge

of any bend shall not be less than ten times the inside diameter of the conduit. The bends of the conduit shall be so made that the conduit will not be injured and that the inner diameter of the conduit shall not be reduced. The conduit shall be mechanically and electrically continuous from fitting to fitting and from cabinet to rack. All cut ends of the conduit shall be reamed to remove rough edges. Bushings shall be provided to protect the wire from abrasion where the conduit enters a cabinet or other fitting. Where practicable, the use of dissimilar metals throughout the system shall be avoided to eliminate the possibility of galvanic action. The metal conduit shall be provided in accordance with FAA-C-1217, paragraphs 3.5 through 3.5.15.

3.3.2.8.1.1 Hardware.- All metallic conduit couplings, connectors, fittings, supports, and support hardware shall be of corrosion-resistant materials or suitably protected against corrosion inside and out by a coating of approved corrosion-resistant materials as zinc, cadmium, or enamel.

3.3.2.8.2 Cable.- The drive motor power cable shall consist of four conductors of copper material to supply power to the 120/208-volt, 3-phase, 3-horsepower drive motor. The size of the conductors will be in accordance with the requirements of FAA-C-1217, paragraphs 3.5.2 through 3.5.2.3, but shall not be smaller than Number 12 AWG, and shall be of Type RHW or THW, 600-volt rating. The conductors shall be continuous between cabinet and rack and there shall be no splices or taps within the conduit itself. When inserting the conductors or cable in the conduit, cleaning agents or lubricants used shall not have a deleterious effect on the conductor coverings. At least six inches of free conductor shall be left at each end of the conduit.

3.3.2.8.2.1 Color coding.- The color coding of the conductor insulation shall be the same as the color coding of the existing conductors.

3.3.2.8.2.2 Solid and stranded wire.- Solid wire shall be used between equipment cabinet terminal blocks. Stranded wire shall be used between the rack terminal block and the drive motor terminals to provide flexibility for equipment servicing and operation.

3.3.2.8.3 Grommets and bushings.- Where conductors pass through metal partitions or shields, the passage holes shall be provided with insulating grommets suitably anchored to preclude their loss. Where conductors enter a conduit in a cabinet, pull box, junction box, or auxiliary gutter, the conductors shall be protected by a substantial bushing to protect the conductors from abrasion. Where the grommets or bushings, or both, are depended on for insulation, they shall conform to the requirements of this specification for insulating materials.

3.3.2.8.4 Plastic sleeving on wire terminations.- Plastic sleeving on wire terminations shall meet the requirements of MIL-STD-454C, Requirement 11, paragraphs 7 through 11 inclusively.

3.3.2.8.5 Circuit breakers.- Circuit breakers shall be provided for each motor, shall be visible and accessible from the front of the rack, and shall conform to MIL-STD-454C, Requirement 37. It shall not be necessary to reach near or beyond open rotating portions of the motor-pump unit to operate the circuit breakers.

3.3.2.8.6 Terminal blocks.- Terminal blocks shall be provided mounted and connected in accordance with MIL-STD-454C, Requirement 19, and FAA-G-2100/1, paragraph 1-3.16.11.

3.3.2.9 Workmanship.- Workmanship shall be in accordance with MIL-STD-454C, Requirement 9, and with FAA-C-1217.

3.3.2.10 Installation booklets.- Complete sets of installation booklets in accordance with Agency Handbook 6032.1, Modifications to Ground Facilities, Systems, and Equipment in the National Airspace System and Agency Order 1320.33, EEM, PEM, EFI and PFI Handbooks. Government approval of draft booklets is required prior to publication. Technical review of the draft booklets will be accomplished within 30 days of receipt by the Contracting Officer's Technical Representative. The contract shall specify the amount of installation booklets to be provided.

3.3.2.11 Guarantee.- The equipment to be furnished under all specification requirements herein shall be guaranteed for a period of two years from the date of acceptance against defective materials, design, or workmanship. Upon receipt of notice from the Government of failure of any part of the guaranteed equipment during the guarantee period, new replacement parts shall be furnished promptly by the Contractor at no additional cost to the Government.

4. QUALITY ASSURANCE PROVISIONS

4.1 Quality control provisions.- The contractor shall provide and maintain a quality control program in accordance with FAA-STD-013a. All tests and inspection made by the contractor shall be subjected to Government inspection. The term "Government Inspector" as used in this specification means that an FAA representative will witness the contractor's testing and inspection and will carry out such visual and other inspection as deemed necessary to assure compliance with contract requirements.

4.2 Factory tests.- Each complete modification kit furnished as a part of the modification requirements shall be tested in accordance with FAA-G-2100/1 with a simulated liquid-cooling circuit at the contractor's plant. Environmental chamber tests will not be required but all new items supplied shall be designed to operate over the service conditions specified. Design calculations, by the contractor, shall be submitted to FAA Contracting Officer at least thirty days prior to factory inspection.

4.2.1 Preliminary factory tests.- The contractor shall furnish the Government at least one copy of any contractor-generated preliminary test data upon request. This requirement is in addition to the preliminary test data required by FAA-G-2100/1.

4.3 Kit proof tests.- Extensive field tests shall be performed by the contractor on the first Type I and Type II modified liquid-cooling systems and shall include all tests listed in the following subparagraphs. The liquid-cooling system modification kits will not be accepted from the contractor until all tests have been successfully completed and all discrepancies have been satisfied at the sites. Final acceptance of subsequent liquid-cooling system modification kits will not be made at the factory until the first Type I and Type II modified liquid-cooling systems have been accepted at the sites and all discrepancies have been satisfied. Applicable portions of these tests shall also apply for additional liquid-cooling system modification kits supplied by the contractor.

4.3.1 Installation tests.- The following areas will be checked during the first article modification and installation to ensure that future modification and installation can be performed by the FAA facility workforce with a minimum disruption to operational requirements and that the modification and installation meets the requirements of this specification.

- (a) Modification and installation shall be performed with contractor-supplied equipment, materials, and supplies.
- (b) Specified drive motor coupler, pump, and mounting base assemblies, coolant reservoir, tubing, fittings, conduit, cable, and hardware are provided for a complete installation.
- (c) Adaptability to existing equipment and available space (electrically and mechanically)
- (d) General appearance of the installation (includes workmanship, location of units, accessibility, and markings on equipment).
- (e) Ease of installation (includes total and downtime).
- (f) Successful completion of tests specified below.

4.3.2 Preinstallation tests.- The Government will provide an operational system that meets or exceeds the operating parameters for the radar system as outlined in Chapter 4, FAA Handbook SM P 6340.2. The contractor shall perform and record the results of the preinstallation tests on the existing system in accordance with a Government-approved test plan. As a minimum, the preinstallation tests shall include the following:

- (a) Coolant pump stop and start switching
- (b) Coolant flow rate

- (c) Coolant pressure
- (d) Coolant temperature
- (e) Coolant pressure relief valve operation to simulate over-pressure condition and to activate automatic control circuitry
- (f) Coolant pressure relief valve operation to simulate underflow condition and to activate automatic control circuitry
- (g) Transmitter power output
- (h) Coolant low temperature bypass valve operation and heat exchanger operation
- (i) Simulate overtemperature condition to activate automatic control circuitry
- (j) Operation of coolant filter bypass valve

4.3.3 Post-installation tests.- The contractor will not proceed with the modification of the second channel of the radar system until the first channel is modified, tested, and meeting the requirements of SM P 6340.2. The post-installation tests include both general and operational tests.

4.3.3.1 General tests.-

- (a) Liquid coolant level
- (b) Inspect all cooling system connections, joints, and couplings
- (c) Operation of drive motor, pump, and mounting base assembly
- (d) Appearance of modified system
- (e) Inspection for leaks under pressure

4.3.3.2 Operational tests.- The following operational tests shall be performed as a minimum:

- (a) Coolant pump stop and start switching
- (b) Coolant flow rate
- (c) Coolant pressure
- (d) Coolant temperature under full power operation of the radar
- (e) Coolant pressure relief valve operation to simulate over-pressure condition and to activate automatic control circuitry
- (f) Coolant pressure relief valve operation to simulate underflow condition and to activate automatic control circuitry

- (g) Transmitter power output
- (h) Coolant low temperature bypass valve operation and heat exchanger operation
- (i) Simulate overtemperature condition to activate automatic control circuitry
- (j) Operation of coolant filter bypass valve and filter operation

4.3.3.3 System operational test.- The liquid cooling system must operate under test conditions for at least 24 hours after the first channel is modified and the operational tests are completed. Test data shall be recorded at least every six hours during the 24 hour test. Any observation of malfunction or instability shall be recorded in the test log. The Government representative(s) shall be permitted to make any number of entries into the log even if not concurred in by the contractor's representative. In the event of failure in the radar system unrelated to the modification, the test time shall be extended by a time equal to the outage. However, in no case shall the test time be extended more than 24 hours for any one radar channel. All specification requirements shall be met during the tests without requiring readjustment of any radar system controls. The radar channel/system shall operate for the entire test period without relevant failure due to any portion of the cooling system furnished, modified, or installed.

5. PREPARATION FOR DELIVERY

5.1 General.- The contractor shall be responsible for shipment, storage, or handling of the first article items furnished under the requirements of this specification until after modification, installation, test, and final acceptance at the two ARSR facilities.

5.2 Preservation, packaging and packing.- Preservation, packaging and packing shall be in accordance with MIL-E-17555 Level "B."

6. NOTES

6.1 Note on information items.- The contents of this Section 6 are only for the information of the initiator of the procurement request and are not a part of the requirements of this specification. They are not contract requirements nor binding on either the Government or the contractor. In order for these terms to become a part of the resulting contract, they must be specifically incorporated in the schedule of the contract. Any reliance placed by the contractor on the information in these subparagraphs is wholly at the contractor's own risk.

6.2 Intended use.- The equipment and materials specified herein are intended to provide a modification kit to the facility workforce to replace and relocate existing equipment and materials in the liquid cooling system of the Air Route Surveillance Radar transmitting equipment to improve the

cooling system reliability and efficiency and to reduce the noise level in the electronic equipment room, thereby affecting an increase in enroute radar system availability essential to the enroute air traffic control system.

6.3 Equipment types.- The contract schedule should state the quantity of Type I and Type II modification kits to be procured for the ARSR systems in the FAA inventory.

6.4 Contractor's proposals.- Each bidder will be allowed access to typical radar sites on a limited and strictly controlled basis. Each bidder should furnish a complete technical proposal. The proposal should include all elements of the items to be produced and the proposed modifications required to the existing equipment. The bidder should submit a proposed design to the Government for review and evaluation. Where it appears that a substantial cost benefit or improved performance may result from the use of electrical or mechanical circuits, materials, processes, and techniques, other than those specified herein, the bidder may submit an alternate proposal in addition to a proposal completely responsive to the specification requirements. The following technical data, as a minimum, should be submitted with each proposal:

(a) Detailed description. The proposal should provide a detailed description of the pump, drive motor coupler, and mounting base assembly. The description should include operating specifications, physical measurements and outline drawings, configuration, layouts, pump input and output port features, clearance factors, and other special details which should be considered for installation, operation, and maintenance of the entire assembly.

(b) Plant description. The proposal should include plant-in-place drawings, schematic, wiring, and tubing diagrams depicting the proposed changes at the site. Consideration should be given to those sites where the plant layout is not typical.

(c) Reliability and maintainability estimates. The proposal should include an analysis of the predicted MTBF, MTTR, and preventive maintenance downtime for the new items being furnished as part of the liquid cooling system modification.

(d) Modification and installation plan. The proposal should include a detailed plan for modification and installation by the facility workforce. The plan should include a manpower schedule, estimate of total time required, downtime required per channel, and test plan execution. Detailed instruction concerning installation of stainless steel pipe and fittings should be included.

(e) Instruction book revisions. The proposal should include a cursory description of the contemplated instruction book revision and an estimate of the number of pages included if revision of the ARSR instruction book is desired.

6.5 Acceptance.- The new equipment (pump, motor drive coupler, and mounting base adaptor) will be inspected at the contractor's plant but acceptance of the first Type I and Type II modification kits will be at the site after installation and completion of tests on site. Additional modification kits will be accepted at the contractor's plant after final factory tests are conducted as required by paragraphs 4.2 and 4.2.1.

* * * * *

TABLE OF CONTENTS

Modification Kits for ARSR Liquid Cooling Systems

1.	<u>SCOPE AND CLASSIFICATION</u>	1
1.1	Scope	1
1.2	Classification	1
1.2.1	Types	1
2.	<u>APPLICABLE DOCUMENTS</u>	1
2.1	FAA Documents	1
2.1.1	FAA Specifications	2
2.1.2	FAA Standards	2
2.1.3	FAA Orders	2
2.1.4	FAA Drawings	2
2.2	Military and Federal Publications	2
2.2.1	Military Standards	2
2.2.2	Military Specification	2
2.3	Other Publications	3
3.	<u>REQUIREMENTS</u>	3
3.1	General Functional Requirements	3
3.2	Government-Furnished Equipment and Services	4
3.2.1	System Availability	4
3.2.2	Work Period	4
3.2.3	Drive Motor, Pump, and Mounting Plate Assembly	4
3.3	Equipment, Services, and Materials to be Furnished by the Contractor	4
3.3.1	First Article Modification Kits, Type I and Type II	5
3.3.2	Modification Kit, Type I and Type II	7
4.	<u>QUALITY ASSURANCE PROVISIONS</u>	10
4.1	Quality Control Provisions	10
4.2	Factory Tests	10
4.2.1	Preliminary Factory Tests	11
4.3	Kit Proofing Tests	11
4.3.1	Installation Tests	11
4.3.2	Preinstallation Tests	11
4.3.3	Post-Installation Tests	12
5.	<u>PREPARATION FOR DELIVERY</u>	13
5.1	General	13
5.2	Preservation, Packaging, and Packing	13
6.	<u>NOTES</u>	13

